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FIGURES

ILLUSTRATING THE STRUCTURE OF VARIOUS

INVERTEBRATE ANIMALS,

(MOLLUSKS AND ARTICULATA).

BY ROBERT GARNER, F.L.S.,
CORRESPONDING MEMBER OF THE DUBLIN UNIVERSITY BOTANICAL
AND ZOOLOGICAL ASSOCIATION, &c.

> "O Lord, how manifold are thy works! in wisdom hast thou made them all: the earth is full of thy riches. So is the great and wide sea, wherein are things creeping innumerable, both small and great beasts. There go the nautili: there is that leviathan, whom thou hast made to play therein. These wait all upon thee; that thou mayest give them their meat in due season."—CONJECTURAL READING.

LONDON:
JOHN VAN VOORST, PATERNOSTER ROW.
1860.

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The accompanying Figures are entirely from the Author's dissections, who thinking that they may be of use or interest to naturalists and physiologists—many of them being from rare or little known animals, and the rest embracing incidents of structure, more or less notable—has taken the trouble, or rather given himself the pleasure of rendering them permanent, and also of procuring a few duplicates, by means of etching—an art, however, in which he confesses himself an untaught and not over successful tyro.

Stoke-upon-Trent, Staffordshire,
July 19*th.*, 1860.

EXPLANATION OF THE PLATES.

PLATE 1, CEPHALOPODA.

FIG. 1.—The anatomy of the Argonaut, the respiratory sac or mantle and siphon being slit, and the viscera displayed.

_s_, siphon : _m_, the cartilaginous prominences of the mantle fitting the acetabula at the base of the siphon : _e_, the ear-sac : _c_, the crop : †, a bristle inserted into a dorsal cavity : _g_, salivary glands : _i_, the ink-bag : _b_, the branchiæ : _st_, the stomach : ||, the cœcal stomach : _r_, the branchial ganglia : _h_, the branchial hearts : _i'_ ganglion of the stomach : 1, nerves of the siphon : 2, do. of the mantle : 3, branchial and visceral nerves : 4, anus : 5, liver : 6, pillars of the siphon : 7, bile-ducts : 8, aorta : 9, ovary : 10, 10 oviducts : _H_, systemic heart drawn down with the left branchial vein cut across.

Many of these references also apply to Fig. 5 of this plate.

2, remains of Pteropoda from the stomach of the Argonaut.

3, Entozoa infesting the same.

4, acetabula of the arms.

5, the buccal mass, exposed from behind, with the brain and eyes, and the alimentary canal opened.

1, nerves of the feet : _C_, brain : _O_, optic ganglia : 2, subocular gland with its duct : 3, crystalline lens : 7, buccal mass : _l_, mouth.

6, side view of the maxillæ.

P, pharyngeal ganglia : _g_, salivary glands.

7, buccal mass opened from before, with the anterior or lower part of the brain, its nerves, and the esophagus.

_t_, tongue : _g_, salivary glands.

8, shews the distribution of the branchial vessels.

9, socket of the tongue and its muscles.

10, plan of the tongue.

PLATE 2, CEPHALOPODA AND PTEROPODA.

FIG. 1.—Sepiola Atlantica with its mantle opened.

_i_, ink-bladder and rectum : _g_. stomach : _o_, ovary : _ov_, oviducts : _b_, branchiæ.

2, the beak of the same.

3, Loligo media.

_o_, ovary : _ov_, oviduct : _b_, branchiæ : _g_, laminated glands : _r_, rectum.

4, young Sepia from ovum.

5, _a b_, shell of do. : _c_, membrane forming the anterior lamina of the shell magnified : _d_, the anterior lamina of the shell seen from before, also magnified : _e_, one of the middle laminæ with its flattened tubes arising from the sinuous lines, highly magnified : _f_, a particle of the adult shell.

6 and 6', spermatic capsules, *&c.*, from the oviduct of the female Sepiola.

7, a plan of the circulation in the Sepia.

a, veins from the feet, eyes, and head passing through a foramen in the front of cranium, and joined by veins *b*, from the buccal mass and nervous centre, to form the commencement of the cava descendens: *c*, veins of the siphon: *d*, of the mantle: *e*, hepatic: *ff*, secreting processes: *g* veins of the stomach: *i*, of the ink-bag, &c.: *h*, veins from the ovary and bottom of the sac: *i'*, veins of the mantle: *A A*, the branchial hearts with their appendages: *j*, branchial arteries: *k*, branchial veins: *b*, systemic heart opened: *l*, the inferior aorta going to the viscera, ink-bag, glands, and bottom of the sac: *m*, a small artery: *n*, the superior aorta: *o*, artery going to the sides of the mantle: *p*, hepatic: *g*, salivary: *r*, the aorta as it enters the cranial cartilage giving off branches (*t*) to the buccal mass, others (*u*,) entering the orbit by a foramen on each side, the vessels then uniting again and lying at first between the esophagus and the lower ganglion of the sub-esophageal mass, then coming forwards (*v*) between the arteries and posterior ganglia, to be distributed to the feet (*w*).

8, the posterior view of a Cleodora, shewing the genital orifice, &c.

9, front view of do.

10, viscera of do. unfolded.

***o*, mouth: *a*, anus: *s*, stomach: *h*, heart: *l*, liver *t*, testis,**

11, the back part of the mantle and its muscular fascicles.

12, the branchial tissue magnified.

13, the front view of Hyalea.

***o*, the mouth.**

14, the back of do. the eyes, tentacles, and genital openings being seen. The viscera are not figured, as they are given by Cuvier, and differ but little from those of Cleodora.

PLATE 3, GASTEROPODA.

FIG. 1, the animal of the Ovula, shewing the reflection of the mantle and situation of some of the viscera, marked by dotted lines.

2, Magilus with the termination of its tube or shell.

3, animal of Nerita littoralis, Lin.

3', its nervous system with visceral and branchial ganglia.

***a*, Ancylus fluviatilis: *b*, its anatomy, the branchia anus &c, being sinistral.**

5, the anatomy of Natica glaucina, its retractor muscle and operculum being seen behind.

6, Doris tuberculata, shewing its internal organs developed, the foot and mantle removed, the branchiæ only partially left; there are minute ganglia on the stomach as well as eye-spots on the brain, the generative organs are on the right, they having been reversed by Cuvier's engraver as in other instances.

7, the brain of Eolis (Cavolina) versicolor.

8, the brain of D. tuberculata as seen from below with the acoustic spots.

***C*, brain: *P*, pharyngeal ganglia: *m*, nerves of the mantle: *b*, of the branchiæ: *f*, of the feet: *r*, nerve forming the subesophageal ring: *g*, of the genital organs: *t*, of the tentacles: *o*, of the mouth and its muscles.**

9, the brain of the Helix aspersa, the ring being divided above and laid out.

***C*. cerebral part of the ring or collar: *P*, pharyngeal ganglia: ††, arteries: *d*, olfactory nerve: *op*. optic do.: *t*, do. to tentacles: *g*, genital: *p*, to the foot: *m*, to the mantle and respiratory collar: *n*, to the side of the neck: *v*, visceral.**

9', the nervous system of Lymnæus stagnalis.

10, the anatomy of the common Aplysia,

the side-processes of the mantle laid aside, and the branchiostegal membrane and the shell removed ; a cœcal appendage to the pylorus as in Doris, and two small branchial ganglia.

(Akera bullata has two ganglia on the left nerve, one on the right, Bullæa only the latter, but two additional at the anterior extremity).

11, the anatomy of Chitonellus.
12, portion of the under surface of do.
12', heart of Chiton marginatus.
13, the animal of Dentalium (a foreign grooved species).

a, the mantle split and turned back : *b*, the foot : *c*, the mouth at the end of a proboscis : *d*, the branchiæ : *e*, intestine : *f*. anus : *g*, muscles.

14, Hipponyx—parasitical upon Delphinula
15, the remarkable genital organs of Onchidium, (from Amoy and apparently the same species as was figured by Cuvier) shewing that it has both testis and ovary distinct. The anterior curious genital organs are not given, as they are accurately figured by Cuvier, but the extremity of his so-called "vaisseau mince " is not floating but attached to the anterior extremity of the side groove.
16, a portion of shell of Acmea virginea magnified.

General references to the Gasteropoda.

f, the foot *m*, the mantle : *b*, branchia : *o*, mouth *a*, anus : *s*, stomach : *h*, heart : *g*, salivary glands : *t*, tongue : *u*, spiny languette, *ov*, ovary and oviduct : *t'* testis (mihi) which however may be an androgynous organ, in which case my ovary must be a nidamentary organ : *k*, mucous sac or kidney : *v*, genital vesicle : *c*, colour gland or vesicle.

PLATE 4, GASTEROPODA—THEIR REPRODUCTIVE ORGANS, &c.

Fig. 1, spermatozoa from Paludina.
2 and 3, the same after the action of water.
4, moving cells from the vesicle of the Helix, and the same after endosmosis.
5, the reproductive organs of Helix aspersa.

t, the testis (conjoined ovary and testis of others): v d, vas deferens opening into the granular groove : or false duct of the matrix, and so going to the penis, (p.) : *o*, the ovary, (mihi, nidamentum of others) : *m*, the matrix : *c*, the cœcal canal in which the ligule or spermatophore is found post coitum : *v*, the vesicle often filled with spermatozoa and the debris of the ligule : †, the vagina which receives the male organ : *s*, the muscular sac containing the dart and having fimbriæ which probably secretes its calcareous matter as well as a rare fluid : *p*,' the appendix of the male organ in which is formed the ligule.

6, a section of the matrix, and of the granular false-duct (vas deferens).
7, the penis cut off, or shewn as protruded with a portion of the enclosed ligule
8, the dart in its muscular sac.
9, the supposed ovary developed, shewing how the vas deferens opens at its lower part.
10, spermatozoa of Helix nemoralis.
11, the same after the action of water.
12, the same degenerating from endosmosis
13, the same undeveloped.
14, spermatozoa from Lymnæus stagnalis.
15, the same undeveloped.
16, mother-cells of the same.
17, ootheca of Ancylus fluviatilis as deposited on stones in rivulets.
18, ootheca and ova of Doris aspera
19, ootheca of Janthina violacea.
20, the foot, &c., of that animal.
21. the reproductive organs of Lymnæus palustris ;

t the testis (mihi) : *v d*, the ciliated vas deferens going to the penis (p), through the receptacle (r) : *o*, the ovary : *m*, the matrix with its convoluted and ciliated part, globular gland, and laminated dilated portion : *v*, the vesicle.

22, oral and lingual pieces of Dentalium.
23, lingual pieces of Hipponyx
24, plan of the tongue of Chiton cinereus.
25, ditto of Chitonellus
26, ditto of Acmea virginea.
27, ditto of Fissurella.

28, silicious teeth from the tongue of Aplysia.
29, ditto of Ovula.
30, ditto of Melania.
31, ditto of Janthina.
32, ditto of Magilus.
33, ditto of Bullæa aperta.

PLATE 5, LAMELLIBRANCHIATA AND BRACHIOPODA.

FIG. 1, Aspergillum Javanum—anterior part of the shell.
2, the disk or rose.
3, the animal extracted.
4, ditto exposed by dissection in the shell.
5, the animal of Vulsella, the left valve and the side of the mouth being removed.
6, ditto of Perna.
7, ditto of Solemya.
8, ditto of Trigonia.
9, ditto of Cyrenoidea.
'General references to the Lamellibranchiata.

†, the mouth : *f*, foot : *b*, branchiæ : *p*, labial palps: *m*, adductor muscles: *r*, retractor do: *s*, stomach: *h*, heart : *c*, crystalline body : *a*, anus.

10, 11, 11', fossil Spirifers, showing their interior.
12, Crania anomala.

a a, the spiral arms: *b b*, the adductor muscles: *d*, the rectum emerging from the liver, which opens into the stomach.

13, the lower valve, mouth, muscles, and ovaries.
14, the same as 12, but showing

c, the mouth : *e e*, the intestinal canal: *b*, the anus.

15, a portion of the mantle magnified, also a portion of the liver, and ova from the mantle.
16, 17, 18, and 19, the anatomy of a species of Lingula from Amoy

c, cilia surrounding the margin of the mantle : *m m*, the lobes of the mantle with the vessels and respiratory striæ : *a*, the spiral arms having a canal common to both : *o*, the mouth with two ganglia upon it : *l*, the liver of a greener colour than the reproductive glands (ov) which apparently open between the mantle-folds in front of the hearts: *h*, the hearts, each consisting of a red-coloured auricle and ventricle: 1, 2, 3, 4, 5, 6, 7, muscles : the stomach and intestine, into the former of which the liver sends three ducts, are seen in Fig. 18. They abounded in Foraminifera.

20, *a*, microscopical section of a pearl of the Mytilus edulis, shewing the dark nucleus and waved nacre: *b*, section of the shell of Crania: *c*, surface of Anomia : *d*, nacre from Vulsella: *r*, surface of a Perna.

20' round particles from the venous organ of mollusks.

a, of the Unio : *b*, of the Helix : *c*, of the Lymnæus: *d*, of the Purpura.

21, the Pedal ganglia and acoustic sacs of Cyclas cornea (480 diam.)

PLATE 6, CIRRIPEDA AND ARTICULATA, (NERVOUS SYSTEM ONLY OF THE LATTER).

FIG. 1, Lepas anatina—the capitulum opened and the pedicle sliced.

†, the mouth : *o v*, ovaries, from which ducts lead towards the openings at the base of the first cirri *o*, the opening by which the fluid is admitted beneath the envelope of the animal's body from the canal of the pedicle : *e*, the eye to which a transparent spot (t) of tunic corresponds : *ad*, the muscle closing the valves, above which is seen the double cerebral ganglion giving nerves to the pedicle and optic filaments: *b*, branchiæ : *a*, the lower cirri having in their base the supposed auditory sac and an enclosed capsule which appears to be deciduous : c, the cirri : *p*, the penis.

1', a view of the animal shewing

(*d*) the oviduct, the eye, (e) and the transparent point in the tunic (s) to admit the light.

2, the Gymnolepas Cuvieri with its auricles and five rudimentary valves.
3, the same with the horny tunic removed and sliced to shew the interior ova, &c

4, the animal removed.

b, the branchiæ : *p*, the penis or ovipositor : *ad*, the adductor muscle : *c*, the anus.

5, portion of the same.

m, the oral apparatus : *s*, the stomach : *t*, the testis: p, the penis.

6, four of the cirri and the male organ and ovipositor of G. vittata.

7, G. Hunteri (?) upon the carapax of a crab from Amoy; here the eye is on the oral side of the adductor, the reverse of it in Lepas.

8, the Hermit crab, Pagurus Bernhardus, shewing the plan of its nervous system.

9, the scorpion shewing its nervous system and that a third column does not exist, a vessel having been mistaken for it.

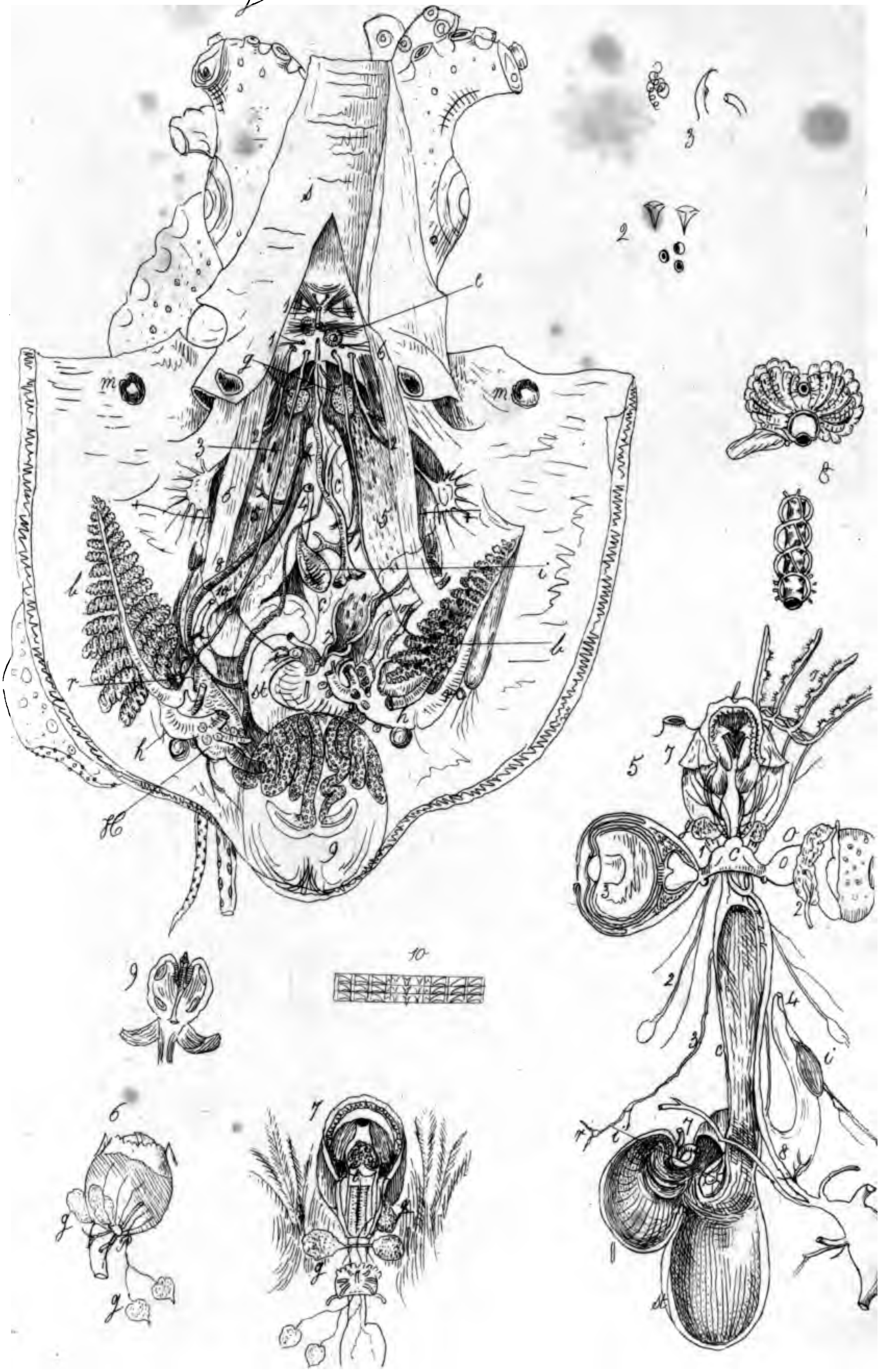
10, the nervous system of a Tarantula seen from below.

11, a, b, c, shew the nervous system of a Scolopendron, the omitted ganglia being but repetitions. There is here no third column as has been described, that part being vascular, the longitudinal cords however seen a little less enveloped by the ganglionic matter on the upper surface.

12, a dissection of the caterpillar of a Lasiocampa, principally to shew the nervous system; much of the fatty matter and many of the tracheal tufts being removed.

G TURNER, PRINTER, LIVERPOOL ROAD, STOKE-UPON-TRENT.

Fig 1



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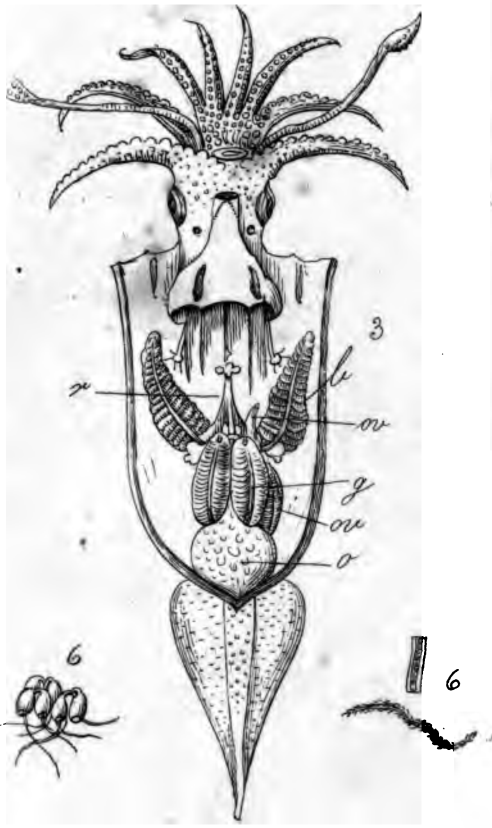
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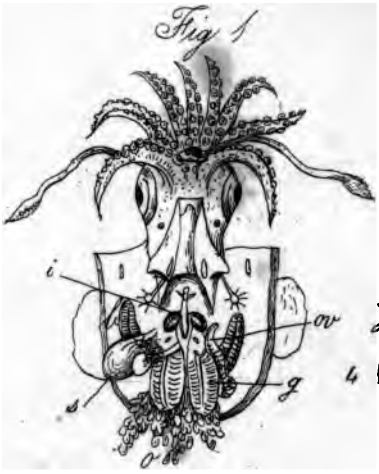
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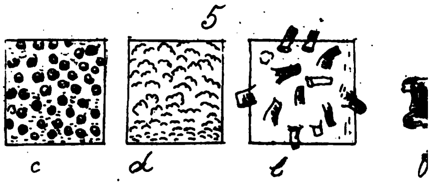
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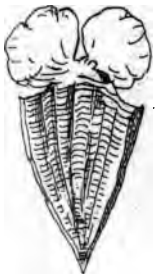
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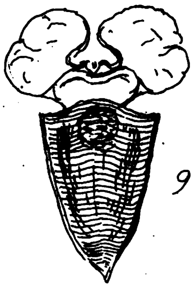
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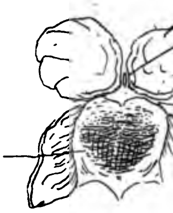
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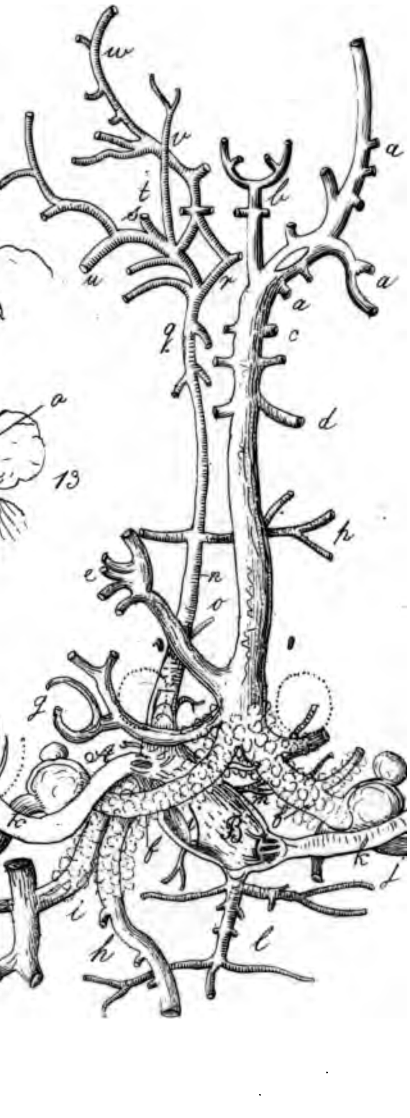
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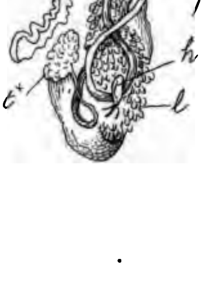
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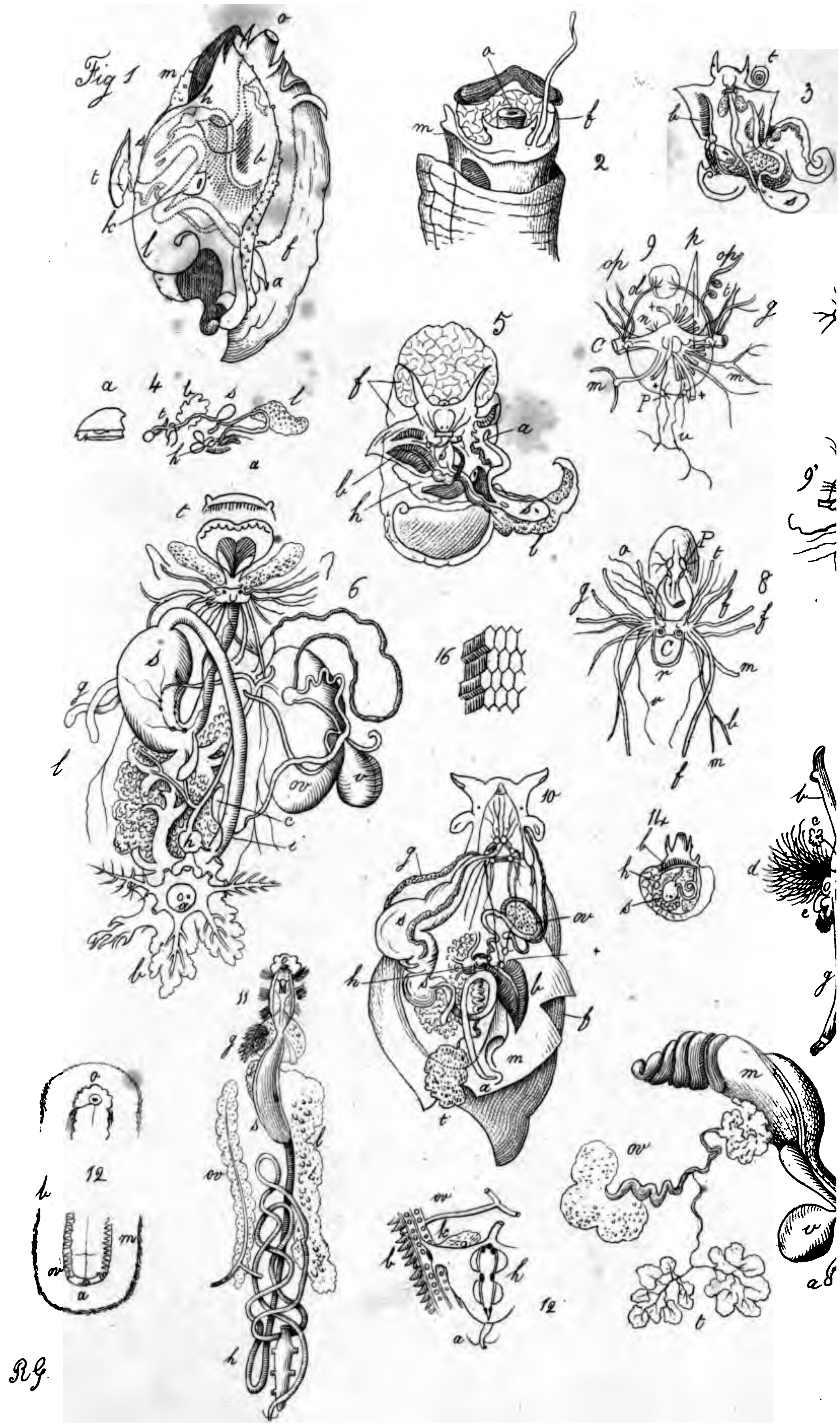
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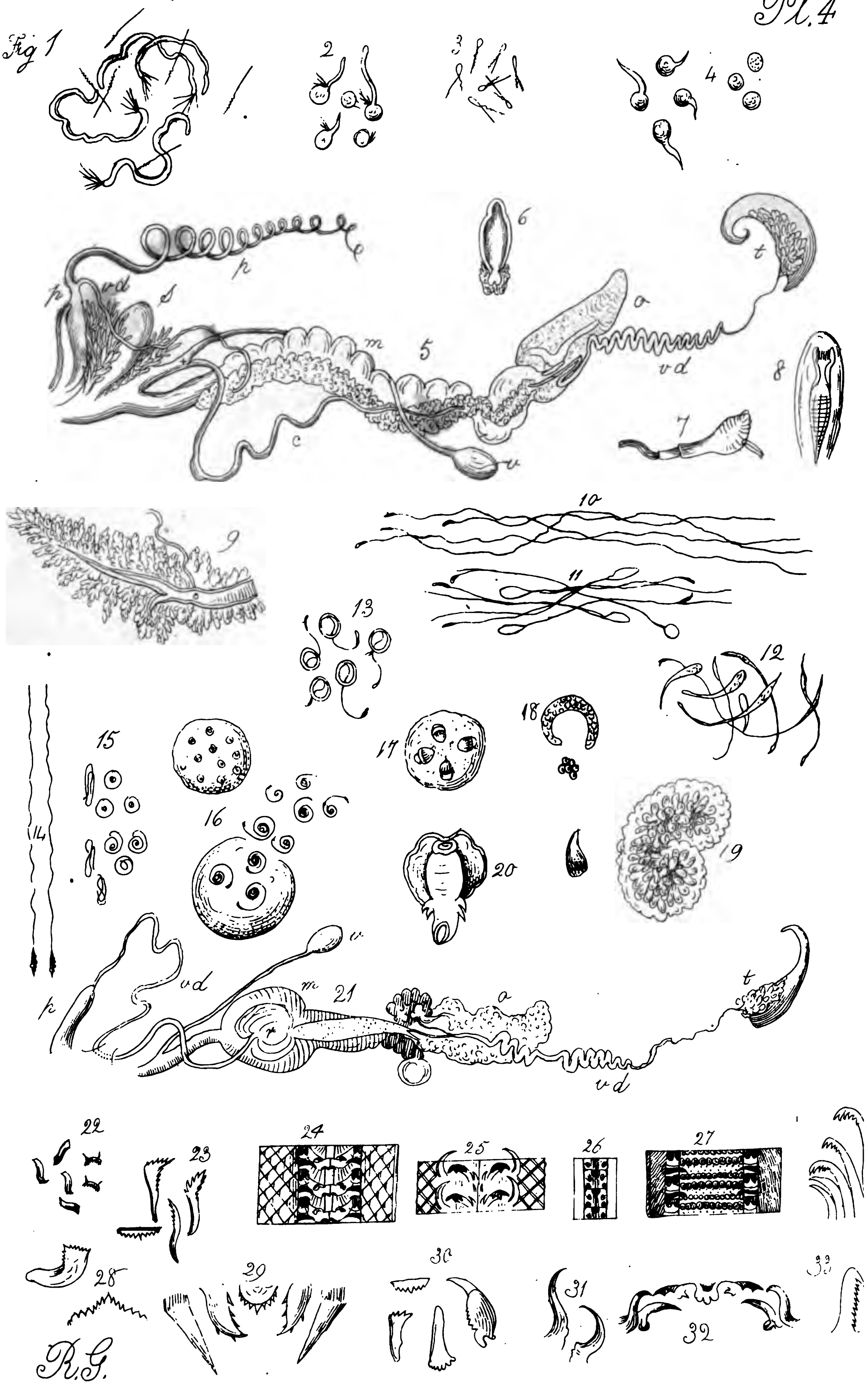
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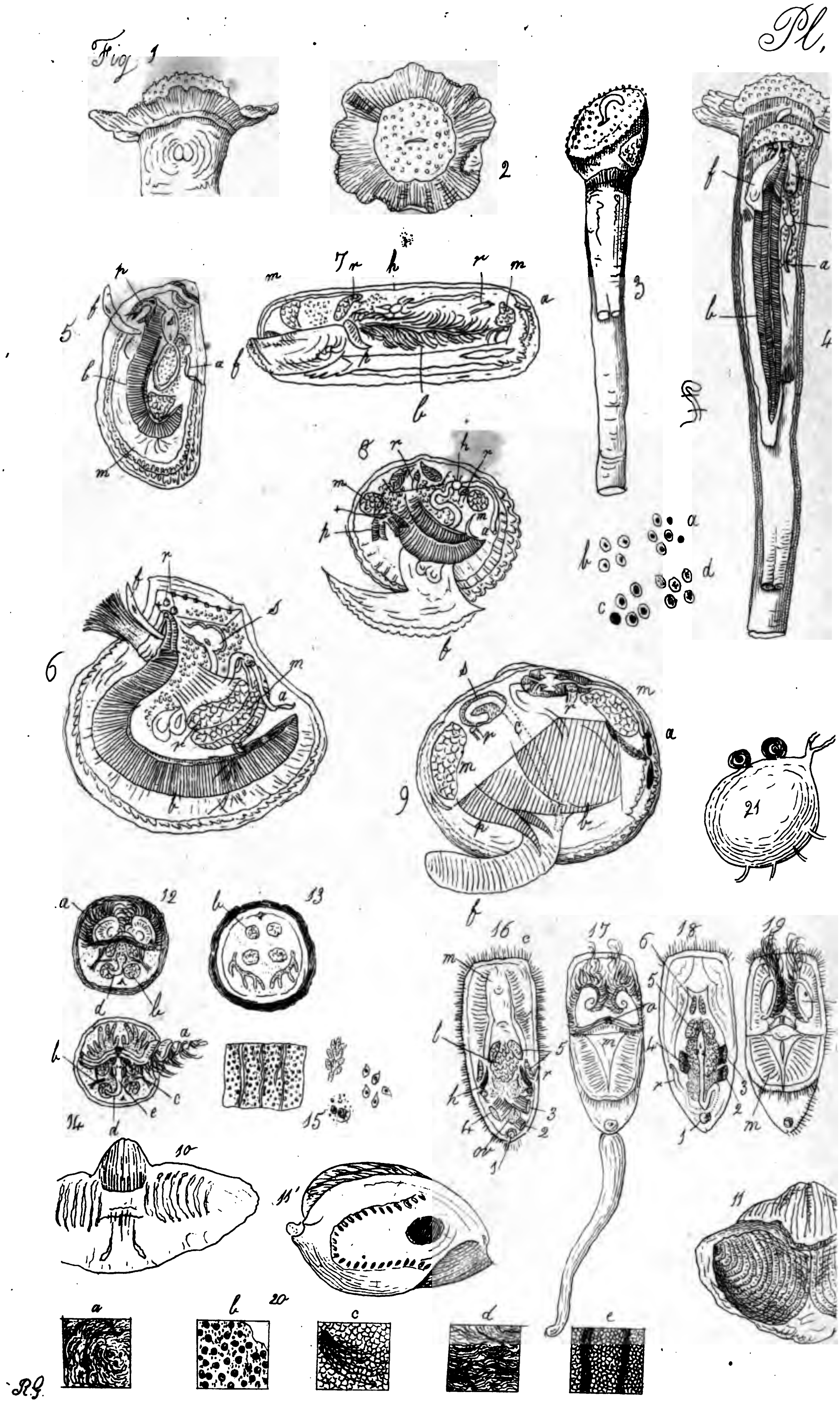
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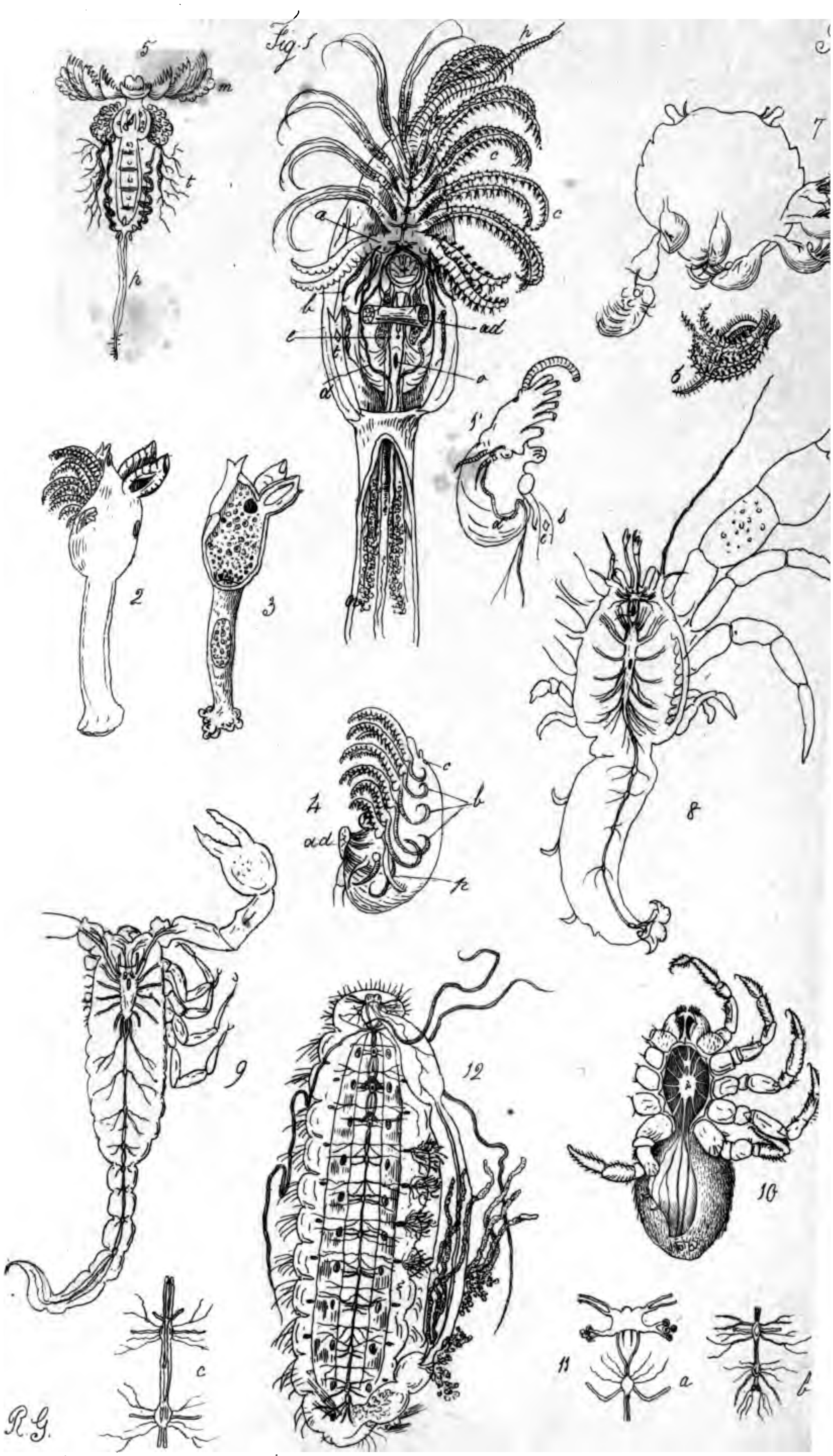
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